

Name \_\_\_\_\_ Date \_\_\_\_\_

## Basics of Radio Astronomy

### Final Quiz

1. The radio frequency static Karl Jansky observed in 1931 with his rudimentary radio frequency antenna peaked 4 minutes \_\_\_\_\_ each day, confirming for him that the source could not be the sun.
2. Radio frequency radiation induces a weak \_\_\_\_\_ in a radio telescope antenna.
3. Electromagnetic radiation travels through space at approximately \_\_\_\_\_ km per second.
4. The frequency of electromagnetic waves is given in units called \_\_\_\_\_.
5. Wavelength of electromagnetic energy is given in \_\_\_\_\_ or some decimal fraction thereof.
6. As electromagnetic radiation spreads out from a source, the area it covers is proportional to the \_\_\_\_\_ of the distance the radiation has traveled.
7. The property that primarily determines the effects of electromagnetic energy, and therefore how we categorize it, is its \_\_\_\_\_.
8. Electromagnetic radiation in the frequency range just higher than x-rays is called \_\_\_\_\_.
9. The radio range includes the \_\_\_\_\_ (longest/shortest) wavelengths in the electromagnetic spectrum.
10. The range of electromagnetic radiation with wavelengths slightly shorter than visible light is called \_\_\_\_\_.
11. The range of electromagnetic radiation with wavelengths slightly longer than visible light is called \_\_\_\_\_.
12. The GAVRT is currently capable of receiving radio waves in the \_\_\_\_\_ and \_\_\_\_\_ bands.

13. Electromagnetic waves include both a(n) \_\_\_\_\_ and a(n) \_\_\_\_\_ vector at right angles to each other and to the direction of wave propagation.
14. The direction of the electric vector describes an electromagnetic wave's \_\_\_\_\_.
15. The most important property of objects in determining the frequency of the radiation they emit is \_\_\_\_\_.
16. In the case of thermal radiation, the higher the temperature of an emitting object, the \_\_\_\_\_ energy is contained in its radiation.
17. An object that absorbs and re-emits all the energy that hits it is called a(n) \_\_\_\_\_.
18. Wien's Law states that the peak amount of energy is emitted at \_\_\_\_\_ wavelengths for higher temperatures.
19. \_\_\_\_\_ is defined as the energy received per unit area per unit of frequency bandwidth.
20. A plot of a brightness spectrum shows the brightness of radiation from a source plotted against the discrete \_\_\_\_\_ comprising that radiation.
21. Emissions due to temperature of an object, ionization of a gas, and line emissions from atoms are all examples of \_\_\_\_\_ radiation.
22. Neutral hydrogen emits radiation at a characteristic wavelength of \_\_\_\_\_ cm .
23. A region of interstellar space containing neutral hydrogen gas is called a(n) \_\_\_\_\_ region, while a region containing ionized hydrogen is called a(n) \_\_\_\_\_ region.
24. Synchrotron radiation is produced when charged particles spiral about within \_\_\_\_\_ field lines.
25. Unlike thermal radiation, the intensity of non-thermal radiation often \_\_\_\_\_ with frequency.

26. A dense molecular cloud that greatly amplifies and focuses radiation passing through it is called a \_\_\_\_\_.
27. The wavelengths of radiation that we can observe from the ground are limited by Earth's \_\_\_\_\_.
28. Radiation that has passed through a cloud of gas produces a spectrum with a characteristic set of dark \_\_\_\_\_.
29. Complex organic molecules have been detected in space using the discipline of \_\_\_\_\_.
30. The angle at which an electromagnetic wave is \_\_\_\_\_ from a surface equals the angle at which it impinged on that surface.
31. The ratio of the speed of electromagnetic energy in a vacuum to its speed in a given medium is that medium's \_\_\_\_\_.
32. Extraterrestrial objects seen near the horizon are actually (lower or higher) \_\_\_\_\_ than they appear.
33. \_\_\_\_\_ is caused by electromagnetic waves from a source becoming out of phase as they pass through a dynamic medium such as Earth's atmosphere.
34. \_\_\_\_\_ is the effect produced when electromagnetic waves become circularly polarized in opposite directions as they pass through magnetic lines of force moving in the same direction as the waves.
35. Gravitational lensing is caused by the \_\_\_\_\_ of space around large masses.
36. Doppler effect causes the frequency of waves from a receding object to appear (lower or higher) \_\_\_\_\_.
37. \_\_\_\_\_ is the apparent faster-than-light motion of a discrete source within a quasar.
38. Occultations provide astronomers good opportunities to study any existing \_\_\_\_\_ of the occulting object.

39. A source of radiation whose direction can be identified is said to be a \_\_\_\_\_ source.
40. The origin of cosmic background radiation is believed to be \_\_\_\_\_.
41. Cepheid variable stars with longer regular periods are more \_\_\_\_\_ than those with shorter regular periods.
42. The activity of the sun varies over about a(n) \_\_\_\_\_-year cycle.
43. Sunspots are (cooler or hotter) \_\_\_\_\_ than the surrounding surface of the sun.
44. The aurora that sometime appears in Earth's upper atmosphere are associated with solar \_\_\_\_\_.
45. A \_\_\_\_\_ is a rapidly spinning neutron star.
46. The predominant mechanism producing radiation from a radio galaxy is \_\_\_\_\_.
47. The most distant objects so far discovered are \_\_\_\_\_.
48. The radio energy from most planets in the solar system is (thermal or non-thermal) \_\_\_\_\_ radiation.
49. On Jupiter, a compass needle would point \_\_\_\_\_.
50. The \_\_\_\_\_ is the region around a planet where the planet's magnetic field dominates the interplanetary field carried by the solar wind.
51. Surrounding Jupiter at approximately the orbit of Io is a strongly radiating \_\_\_\_\_.
52. Radio telescopes are best placed in (high or low) \_\_\_\_\_ locations.

53. The great circle around Earth that is at every point the same distance from the north and south poles is called \_\_\_\_\_.
54. Great circles that pass through Earth's north and south poles are called \_\_\_\_\_.
55. In Earth's coordinate system, the north-south component of a location is called \_\_\_\_\_.
56. In Earth's coordinate system, longitude is measured from the \_\_\_\_\_.
57. A solar day is about 4 minutes (longer or shorter) \_\_\_\_\_ than a sidereal day.
58. The Earth's axis precesses around a complete circle having a 23.5 degree radius relative to a fixed point in space over a period of about \_\_\_\_\_.
59. A diagram that shows a 360° silhouette of the horizon as viewed from a particular location is called a(n) \_\_\_\_\_.
60. In all astronomical coordinate systems and in general usage, \_\_\_\_\_ is directly overhead and \_\_\_\_\_ is directly below the observer.
61. In the horizon system of coordinates, the horizontal component of an object's coordinates is given by the \_\_\_\_\_.
62. In the horizon system of coordinates, the vertical component of an object's coordinates is given by the \_\_\_\_\_.
63. In the equatorial coordinate system, an object's east-west component is given as its \_\_\_\_\_.
64. In the equatorial coordinate system, an object's north-south component is given as its \_\_\_\_\_.
65. \_\_\_\_\_ is a date of reference used in sky almanacs to take into account slight variations in the celestial coordinates of objects due to the precession of Earth's axis.

66. The \_\_\_\_\_ is the plane formed by the orbit of Earth around the sun.
67. The reference in the \_\_\_\_\_ coordinate system is a plane through the sun parallel to the mean plane of the Milky Way galaxy.
68. In the Milky Way galaxy alone, the number of planetary systems could be on the order of \_\_\_\_\_.
69. The diameter of our galaxy is around \_\_\_\_\_ light years.
70. Astronomers estimate the age of the Universe to be on the order of 15 \_\_\_\_\_ years.